

REMARKS

Claims 1, 3-4, 6-7, 9 and 11-17 were pending.

Claims 1, 6 and 15 are amended.

Claims 8-11 are cancelled.

Claims 18 is new.

Claims 1, 3-4, 6, 12-13 and 15-18 now are pending.

Amended Claims 1, 6 and 15

Claim 1 is amended to define the second flocculant more distinctly. The second flocculant is claimed as a water-soluble or water swellable polymer formed from 50 to 100% by weight methyl chloride quaternary ammonium salt of dimethylamino ethyl (meth)acrylate and 0 to 50% by weight acrylamide of intrinsic viscosity between 4 and 10 dl/g. Support for this amendment may be found in original claim 9.

Further the dry polymer particles must be of at least 50 microns. This amendment is supported by claim 15 or alternatively by the disclosure on page 7, lines 1-12

Additionally the first flocculant is amended to include a molecular weight limitation. The molecular weight is at least 1 million. Support for this amendment may be found on page 8, first paragraph.

Claim 6 amendment is supported by the disclosure of page 10 first paragraph.

Claim 15 amendment is supported on page 7, lines 3 and 11.

No new matter is added.

New Claim 18

Support for new claim 18 may be found on page 8, line 4.

No new matter is added.

35 USC 103(a)

Claims 1, 3, 6, 7, 9, 11, 14, and 17 are rejected under 35 USC 103(a) as being unpatentable over Sander, US 4,840,736 in view of Sorensen, US 5, 846,433.

The examiner believes Sanders to disclose a process for dewatering sewage sludge substantially as claimed. Sanders discloses at col. 2, lines 17-30 that the sewage sludges are concentrated by adding an organic flocculant during thickening by gravity sedimentation. The sludges are treated, before, during or after admixture of the additives, with a further 2-8 kg of organic flocculant/tonne of sludge solids and are then dewatered on the filter press.

Examiner agrees that Sander does not recite that the second flocculant is in the form of dry particles. Additionally Sanders does not teach the addition of an aqueous composition comprising dissolved or hydrated polymer having a polymer concentration of at least 2%. Applicants note that claim 4 is not part of the above rejection.

However, Sorensen discloses that it is known in the art to utilize a second flocculant comprising dry particles in a process of thickening dewatering a sewage sludge Examiner refers to col. 3, lines 15-22 which recites

"the dewatering process can involve sedimentation but generally is a mechanical dewatering process, for instance filtration or other thickening process which will produce a thickened sludge. However the process is primarily intended for control of mechanical dewatering processes which produce cake, such as centrifugation, belt pressing or filter pressing".

Thus examiner believes that it would be obvious to one skilled in the art to modify the process of Sander by utilizing the recited dry particles in view of the teachings of Sorensen to aid in dewatering sewage sludge.

Respectfully applicants disagree with the examiner's analysis:

- Claim 1 has been amended to require that the second polymer is a particular type of cationic polymer of a particular range of intrinsic viscosities; the first polymer is a cationic acrylamide of a molecular weight of at least 1,000,000 and the dry particles must be at least 50 microns. This amendment more closely reflects the applicants showing in examples. See tables 1 and 2.
- Neither Sanders nor Sorensen teach dry particle sizes of at least 50 microns. Sorensen only teaches flocculant polymers introduced in the form of small particles (below 10 microns). See col. 7, line 56. At a minimum this combination of references does not arrive at the present claim limitations because there is no teaching in either reference for a dry particle size of at least 50 microns.

- Additionally, Sanders does not teach specific flocculant polymers formed from 50 to 100% by weight methyl chloride quaternary ammonium salt of dimethylamino ethyl (meth)acrylate and 0 to 50% by weight acrylamide of intrinsic viscosity between 4 and 10 dl/g.
- Sorensen however teaches similar polymers. But Sorensen also requires the use of a coagulant AND flocculant. Sorensen defines his coagulants as having a molecular weight below 1 million. See col. 4, lines 20-22 and his flocculants as having an intrinsic viscosity above 4 dl/g.
- The present claim limitations require that the first flocculant has a molecular weight of at least 1 million and the second flocculant has an intrinsic viscosity of between 4 and 10 dl/g thus distinguishing the presently claimed flocculants from Sorensen's coagulants.
- There is not sufficient direction from either Sorensen or Sanders to replace the cationic flocculant polymers in the method of Sanders with either the coagulants or flocculants taught in Sorensen as the point and purpose of the Sorensen invention is the combination of flocculant with coagulant and Sanders is directed to a combination of two cationic flocculants.
- Accordingly, there is no motivation given the teachings of Sorensen to substitute his flocculants in the method of Sanders.

35 USC 103(a)

Claims 15 and 16 are rejected as being unpatentable over Sanders et al in view of Sorensen as above and further in view of Payne, US 5,698,109..

The claims differ as explained by the examiner by reciting that the dry particles have a specific diameter. Specifically examiner refers to col. 5 line 9 through col. 8 line 48.

Applicants submit that Payne is directed to low molecular coagulants such a DADMAC or DMAEMA polymers. Payne defines his low molecular weight polymers as having an intrinsic viscosity generally in the range of 0.2 to 2 dl/g, preferably in the range of about 0.5 to 3, and the preferred molecular weight is below about 1 million. See col. 8, lines 40 to 48. Thus none of the polymers disclosed in Payne meet the limitations of the presently claimed flocculants. Accordingly there is no reason why one skilled in the art would look to Payne for a teaching of the particle size of the presently claimed flocculants as Payne is not directed to flocculants at all.

Claims 1, 3, 6, 7, 9, 11-14 are rejected under 35 USC 103(a) as being unpatentable over Sander, US 4,840,736 in view of Ghafoor, US 6,001,920.

Sanders is applied as above. The claims differ from Sander by reciting that the second flocculant is/in the form of an aqueous composition having a specific polymer concentration. Ghafoor discloses that it is known to use flocculant compositions having a concentration of 5% by weight to aid in flocculating sludge suspensions. Examiner believes it would be obvious to one skilled in the art to modify the process of Sander by utilizing the recited concentration in view of the teachings of Ghafoor absent a sufficient showing of unexpected results.

Applicants disagree. The examiner has maintained that Sander teaches the steps substantially as claimed. However, one skilled in the art would need to apply the concentrated cationic solutions of Ghafoor to the thickened suspension of Sanders, mix said concentrated cationic solutions into the thickened suspension formed in present step a) then subject to mechanical dewatering to form a cake. While one skilled in the art might carry out this order of steps using a concentrated solution of Ghafoor, there are no examples within Ghafoor which actually use such concentrated solutions and certainly no direction from Sanders to use such concentrated solutions within his thickening step. Nor is there any recognition within Ghafoor or Sanders that such concentrated aqueous compositions ~~in~~ would give improved cake formation when added and mixed with the thickened suspension.

Applicants believe that the selection by the examiner of various elements known in the cited (such as concentrated aqueous solutions of flocculants ranging from 0.1 to 5%) is not really a teaching with sufficient direction to apply the same concentrated solutions during the thickening step of Sanders.

Nevertheless, applicants refer examiner to Tables 1 and 2. Comparison of the results of Table 1 and 2 show that the two stage addition of polymer produces significantly better cake solid results (Table 1) when a high strength solution is applied in the thickening step.

The examples use polymer A, a high molecular weight cationic acrylamide as the first flocculant and polymer B, as the second flocculant, a cationic quaternized dimethyl amino ethyl methacrylate based homopolymer of IV 5 dl/g. The high strength solution used in Table 1 for polymer B is 5 wt. %.

Table 2 shows that the sequence of addition matters. The improvement only results when two stage addition is carried out, that is when concentrated polymer B is applied to the thickened suspension.

Table 2 further shows that simultaneous addition of Polymer B with Polymer A at conventional dilution, using either a high strength solution or as dry polymer, does not give an improved result compared to simultaneous addition using conventional concentration.

Claim 1 has been amended to reflect this chemical makeup of the first and second flocculants. The unexpected improvements shown in Table 1 are also reflected in the explicit claim steps- two stage addition of the first and second flocculants with the addition of the second flocculant in the thickening step.

Applicants believe the above rejection is overcome for several reasons. There is not sufficient direction from either Ghafoor or Sanders to apply the second flocculant in concentrated form to the thickened suspension or alternatively, the results shown in Table 1 indicate improved cake percent when the dewatering takes place using the method as claimed.

Double Patenting Rejection

Applicants wish to put off the filing a terminal disclaimer until the other issues are resolved and applicants know the final state of the claims. At that time, applicants can better evaluate the suitability of filing a terminal disclaimer.

Reconsideration and withdrawal of the rejection of claims 1, 3-4, 6, 12-13 and 15-18 are respectfully solicited in light of the remarks and amendments *supra*.

Since there are no other grounds of objection or rejection, passage of this application to issue with claims 1, 3-4, 6, 12-13 and 15-18 is earnestly solicited.

Applicants submit that the present application is in condition for allowance. In the event that minor amendments will further prosecution, Applicants request that the examiner contact the undersigned representative.

Respectfully submitted,



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